CHAPTER 1

Executive Summary

http://www.epa.gov/oar/aqtrnd97/chapter1.pdf

This is the twenty-fifth annual report documenting air pollution trends in the United States.[1-24] The scope of this report includes the criteria pollutants for which the United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS), hazardous air pollutants, known as air toxics, visibility impairment, and acid rain.

The six criteria pollutants - carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2) - are the focus of chapters 2 through 4. Chapters 2 and 3 present national, regional, and metropolitan area trends, while Chapter 4 summarizes how areas around the nation are doing with respect to meeting the NAAQS.

Air toxics, another set of pollutants regulated under the Clean Air Act (CAA), are discussed in Chapter 5. Both ambient toxics and the deposition of toxics are addressed in this chapter. Visibility impairment due to regional haze is discussed in Chapter 6, and acid deposition resulting from SO_2 and NO_x emissions is the topic of Chapter 7.

Discussions throughout this report are based on the recognition that many of the programs designed to reduce ambient concentrations of the criteria pollutants also aid in reducing pollution that contributes to air toxics pollution, visibility impairment, and acid rain. Likewise, requirements under the various air toxics, visibility, and acid rain programs can also help reduce emissions that contribute to ambient concentrations of the criteria pollutants.

CHAPTER 2 CRITERIA POLLUTANTS - NATIONAL TRENDS

National and regional air quality trends for the criteria pollutants are examined in Chapter 2, along with supporting emissions data. The air quality concentrations presented are based on actual measurements of pollutant concentrations in the air at selected monitoring sites across the country (see Appendix B for details on the monitoring networks). Emissions estimates presented are calculated from the total tonnage of these pollutants, or their precursors, released into the air annually.[25]

Table 1-1 summarizes the 10-year percent changes in national air quality concentrations and emissions between 1988 and 1997. Air quality has continued to improve during the past 10 years for all six pollutants. Nationally, the 1997 average air quality levels are the best on record for all six criteria pollutants, posting concentrations at or below last year's levels. Furthermore, all the years in the 1990s have had better average air quality levels than any of the years in the 1980s, showing a steady trend of improvement for each pollutant.

Emissions of all criteria pollutants have decreased as well, with the exception of NO_x. In September 1998, EPA issued a rule that will significantly reduce regional emissions of NO_x and, in turn, reduce the regional transport of ozone. This Regional Transport Rule is discussed in greater detail in the ozone section of Chapter 2.

Table 1-1. Percent Decrease in National Air Quality Concentrations and Emissions, 1988-1997.

	Air Quality Concentration % Decrease	Emissions % Decrease
CO	38	25
Pb	67	44
NO_2	14	1 (NO_x)
O_3	19(1-hr) 16(8-hr)	20 (VOC)
PM_{10}	26	12*
SO_2	39	12

*Includes only directly emitted particles. Secondary PM formed from SO_x, NO_x, and other gases comprise a significant fraction of ambient PM.

Trends relating to the revised ozone and PM NAAQS based on data currently available are also presented. In July 1997, EPA revised the ozone and particulate matter standards following a thorough scientific review process. Prior to this time, the PM standard applied to particles whose aerodynamic size is less than or equal to 10 micrometers, or PM_{10}. The NAAQS revision strengthened protection against particles in the smaller part of that range by adding an indicator for $PM_{2.5}$ (those whose aerodynamic size is less than or equal to 2.5 micrometers). The combination of the PM_{10} and $PM_{2.5}$ indicators provide protection against a wide range of particles in both size and composition. The revised ozone standard is now based on an 8-hour averaging time as opposed to 1-hour under the pre-existing standard. Since the pre-existing ozone and PM NAAQS still apply in some areas (see Chapter 2 for details), trends relating to the pre-existing NAAQS are also discussed in Chapter 2.

CHAPTER 3 CRITERIA POLLUTANTS - METROPOLITAN AREA TRENDS

Chapter 3 characterizes air quality on a more local level, using three different indicators. First, this chapter lists peak air quality concentrations for 1997 for each Metropolitan Statistical Area (MSA). Second, 10-year trends are assessed for each MSA using a statistical method to measure whether the trend is up or down. The results show that 15 MSAs had a statistically significant upward trend in ambient concentrations for at least one criteria pollutant, while 221 MSAs had a statistically significant downward trend for at least one criteria pollutant. Maps are used to show how these trends vary spatially. The third way in which local air quality is evaluated is by looking at the Pollutant Standards Index (PSI) in the nation's largest MSAs. The PSI analysis shows that between 1988 and 1997 the total number of "unhealthy" days decreased an average of 56 percent in southern California (which, for the purposes of this analysis, includes the Los Angeles, Riverside, Bakersfield, and San Diego MSAs) and an average of 66 percent in the remaining major cities across the United States.

CHAPTER 4 CRITERIA POLLUTANTS - NONATTAINMENT AREAS

Chapter 4 summarizes the current status of nonattainment areas, which are those areas not meeting the NAAQS for at least one of the six criteria pollutants. Under the Clean Air Act Amendments (CAAA) of 1990, there were 274 areas designated nonattainment for at least one ambient air quality standard. As of September 1998, 130 areas are still designated nonattainment. The current nonattainment area list is based on the pre-existing ozone and PM standards. In future years the nonattainment area list will reflect areas not meeting the revised ozone and particulate matter standards. The current nonattainment areas for each criteria pollutant are displayed on one map in this chapter, while a second map depicts the current ozone nonattainment areas alone, color-coded to indicate the severity of the ozone problem in each area. The condensed list of nonattainment areas as of September 1998 is presented in Table A-17. This table is also on the Internet at **http://www.epa.gov/airs/nonattn.html** and is updated as areas are redesignated.

CHAPTER 5 AIR TOXICS

Chapter 5 presents information on another set of air pollutants regulated under the CAA. Hazardous Air Pollutants (HAPs), commonly called air toxics, are pollutants known to cause or suspected of causing cancer or other serious human health effects or ecosystem damage. There are now 188 such pollutants. The National Toxics Inventory (NTI) estimates that 8.1 million tons of air toxics are released to the air annually from stationary, area, and mobile sources. This emissions inventory is now being substantially upgraded with input and review by the states.

While there is currently no national monitoring network designed to measure air toxics, EPA has several efforts underway which provide some information useful to assessing the toxics issue. For instance, the Agency's Photochemical Assessment Monitoring Stations (PAMS) program, which is designed to monitor ozone precursors in several major U.S. cities, provides ambient concentration data for 10 HAPs which are also ozone precursors. In addition to the PAMS program, EPA continues to administer and support voluntary programs through which states may collect ambient air quality measurements for a number of air toxics. Concurrent with these monitoring efforts, EPA has recently initiated a program to identify, compile, and catalogue all previously collected monitoring data for air toxics.

In addition to the emissions inventory and limited air quality

monitoring information, EPA has developed a model to estimate air toxics concentrations nationwide based on emissions inventory and meteorological information. EPA has used this model to estimate air toxics concentrations for 1990, based on preliminary information on emissions and background concentrations as part of the Cumulative Exposure Project (CEP). EPA plans to upgrade and use this model periodically in future years to help track estimated air toxics concentrations and progress in efforts to address potential public health and environmental concerns associated with air toxics.

Because of their complex nature and sheer number, air toxics are regulated differently than the criteria pollutants. The approach is two-phased. The first phase consists of identifying the sources of toxic pollutants and developing technology-based standards to significantly reduce their emissions. This phase includes the MACT (Maximum Achievable Control Technology) program, as well as regulations under the specific pollutants and urban area source programs. Already, the MACT program has reduced HAP emissions across many of the source categories by more than half of the pre-MACT levels (see Table 5-1 for more details).

The second phase consists of strategies and programs for evaluating the remaining risks and ensuring that the overall program has achieved substantial reduction in risks to public health and the environment. This phase will involve additional reductions and incorporate information developed on remaining risks due to cumulative exposure to emissions from mobile as well as stationary sources. This work will be implemented primarily through the integrated urban air toxics strategy and residual risk programs, as well as utilizing information from special studies on atmospheric deposition, mercury, and utilities.

CHAPTER 6 VISIBILITY TRENDS

The CAA authorizes EPA to protect visibility, or visual air quality, through a number of programs. In 1987, the Interagency Monitoring of PROtected Environments (IMPROVE) visibility monitoring network was established as a cooperative effort between EPA, National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish & Wildlife Service, and state governments. The objectives of the network are to establish current conditions, to track progress toward the national visibility goal by documenting long-term trends, and to provide information for determining the types of pollutants and sources primarily responsible for visibility impairment.

The trends analyses presented in this chapter are based on data from the IMPROVE network. There were 37 sites having data adequate for assessing trends between 1988 and 1997. Because of the significant regional variations in visibility conditions, the trends are grouped into eastern and western regions, rather than a national aggregate. The trends are presented in terms of the annual average values for the clearest ("best"), middle, and haziest ("worst") days monitored each year.

The results show that, in general, visibility is worse in the east than in the west. In fact, the worst visibility days in the west are only slightly more impaired than the best days in the east. The 10-year trends show that visibility in the west has improved slightly for all three ranges (best, middle, and worst days), while visibility in the east does not seem to be improving for any of the ranges.

In July 1997, EPA proposed a new regional haze program to address visibility impairment in national parks and wilderness areas caused by numerous sources located over broad regions. The proposed program takes into consideration scientific findings and policy recommendations from a number of sources. Because of the common precursors and the regional nature of the ozone, PM, and regional haze problems, EPA is developing these implementation programs together to integrate future planning and control strategy efforts to the greatest extent possible. Implementation of the NAAQS in conjunction with a future regional haze program is expected to improve visibility in urban as well as rural areas across the country.

Other air quality programs are expected to lead to emissions reductions that will improve visibility in certain regions of the country. The acid rain program will achieve significant regional reductions in SO_x emissions, which is expected to reduce sulfate haze particularly in the eastern United States. The recent NO_x State Implementation Plan (SIP) call to reduce emissions from sources of NO_x to reduce formation of ozone should also improve regional visibility conditions to some degree.

CHAPTER 7 ACID DEPOSITION

New to the report this year, the acid deposition chapter presents information concerning wet acidic deposition (commonly called acid rain) and dry

acidic deposition. Wet deposition occurs when gaseous or particulate pollutants enter water droplets in the air, and fall as rain, snow, or other precipitation. Dry deposition occurs when particles settle by gravity or when gaseous pollutants are adsorbed by surface waters or bound chemically to soil surfaces.

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) and the Clean Air Status and Trends Network (CASTNet), two monitoring networks described in detail in the chapter, monitor wet and dry acid deposition, respectively. NADP/NTN consists of nearly 200 sites nationwide, while CASTNet contains 72 sites. These sites monitor a number of compounds, including sulfates and nitrates, which are formed from sulfur oxides and nitrogen oxides reacting in the atmosphere.

Wet deposition data from the NADP/NTN show that sulfate concentrations in precipitation have decreased over the past two decades, with a particularly sharp decrease occurring since 1994 in the eastern United States. This recent reduction is directly related to large regional decreases in SO_2 emissions resulting from phase I of the Acid Rain program (see the SO_2 section in Chapter 2 for more details). Nitrate concentrations in recent years at the NADP/NTN sites are not appreciably different from historical levels.

Dry deposition data from the CASTNet sites show that sulfate concentrations decreased 26 percent between 1989 and 1995. During that same period, total nitrate concentrations decreased 8 percent. Nitrate concentrations should continue to decline due in part to the implementation of the Phase I Acid Rain NO_x Control Program, along with the Regional Transport rule, both of which are designed to reduce NO_x emissions. (NO_x is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. The criteria pollutant NO_2 is a common form of NO_x and is prevalent in NO_x emissions from the burning of fuels at high temperatures, as in a combustion process.)

In addition to the trends information in this chapter, maps of the 1997 wet and dry deposition data are also presented.

The Appendices

Finally, Appendix A provides expanded tables of the air quality concentrations and emissions data described throughout this report. Appendix B summarizes the methodology which is the basis for the trends analyses in Chapter 2, and also provides maps of the current monitoring network for each criteria pollutant.

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25. Emissions estimates are derived from many factors, including the level of industrial activity, technology changes, fuel consumption, vehicle miles traveled (VMT), and other activities that affect air pollution. In 1994, EPA began incorporating direct emissions measurements of sulfur dioxide and nitrogen oxides (NO_x) for the electric utility industry. Additional emissions information can be found at **http://www.epa.gov/oar/oaqps/efig.**